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Goddard Space Flight Center

Use of Cermet Thin Film Resistors with Nitride Passivated Metal Insulator Field Effect Transistor

Composite ceramic-metal (cermet) resistors have been successfully film-deposited on chip-substrated metal-nitride-oxide-silicon field effect transistors (MNOSFET's). These thin film load resistors were produced on a single chip by compatible processes and were found to suffer less degradation after electron radiation than conventional metal oxide semiconductor field effect transistors (MOSFET's) previously tested.

The bi-layer silicon nitride-silicon dioxide gate insulators employed were equivalent in capacitance to only 500Å of SiO_2, and exhibited much greater reliability than a single agate insulator of 500Å of silicon dioxide alone, which is difficult to produce in high yield. Successful placement of the cermet resistor on the same chip with the active transistor circuitry was possible because the silicon nitride, which forms an integral part of the active devices, is also an effective barrier to a wide variety of ionic species (hydrogen, oxygen, nitrogen). Thus, the contamination-sensitive active devices are protected from contaminants that are produced in the cermet deposition and definition processes.

Notes:

1. Important advantages in terms of lower cost, greater reliability, and space savings are realized by combining the active and passive circuit elements on a single chip. For the particular circuit constructed, a function space saving of a factor of five over the circuit plus discrete load resistor should be realized.
2. The following documentation is available from:
   National Technical Information Service
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.95)
   Reference:
   NASA-CR-97459 (N69-10283), Development of Silicon Nitride and Cermet Resistors for use in a Binary Counter, Metal Insulator Field Effect Transistor Circuit.

Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to:

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